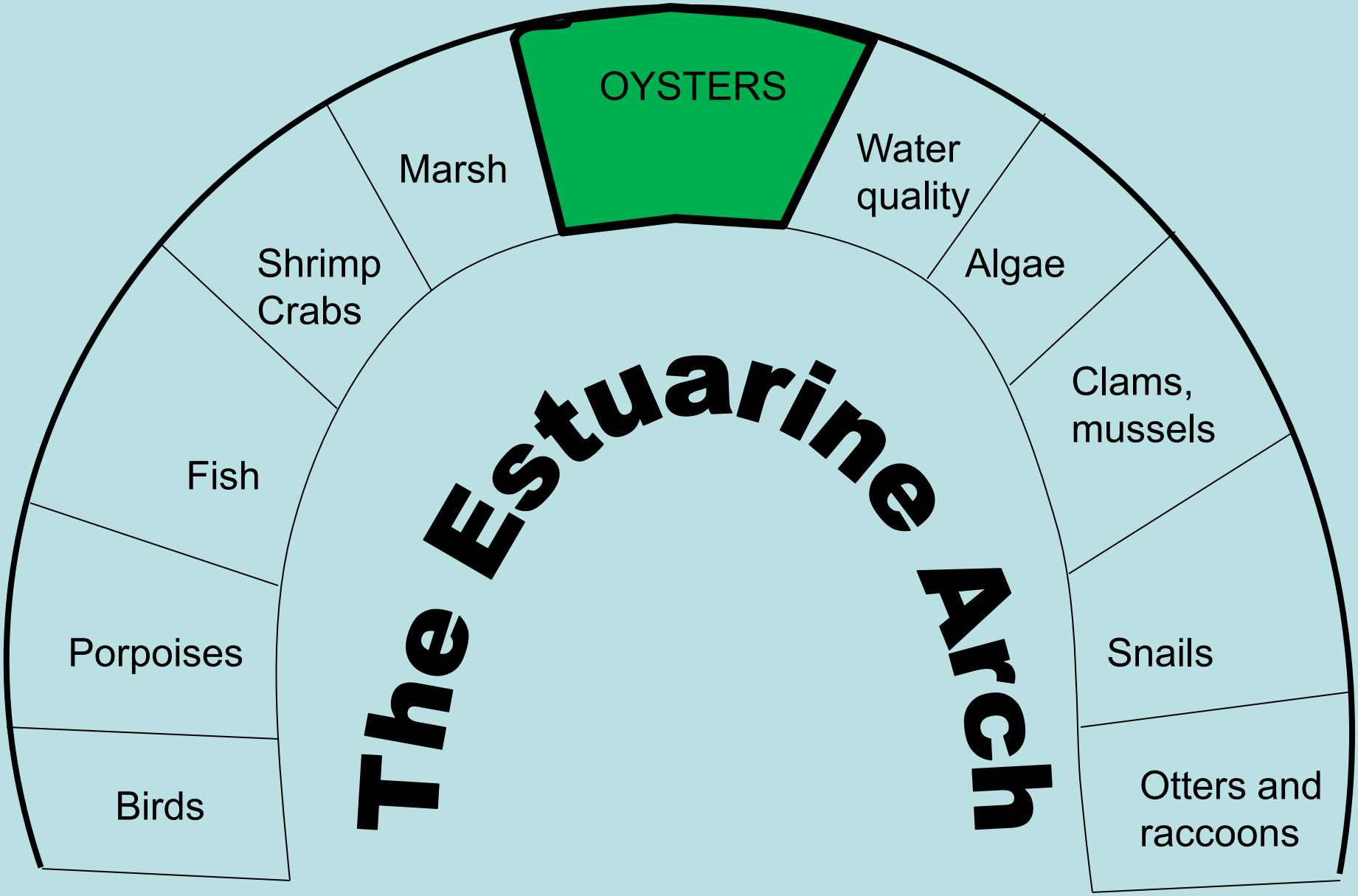

SOUTH CAROLINA
DEPARTMENT OF NATURAL RESOURCES
DNR
Oysters:
Key to the health of our estuaries

Oysters are a keystone species



Thanks to Bruce White for the graphic concept.

Oyster Reefs

- Provide food for fish, crabs, birds, raccoons and you!
- Are an important economic resource
- Filter water
- Create fish habitat
- Are natural breakwaters protecting shorelines

Oysters are Nature's Filters

- A single adult oyster can filter 2.5 gallons water per hour: 50 gallons per day!
- Controls phytoplankton
- Removes silt
- Improves water quality
- Nutrient transfer

Oysters Create Habitat

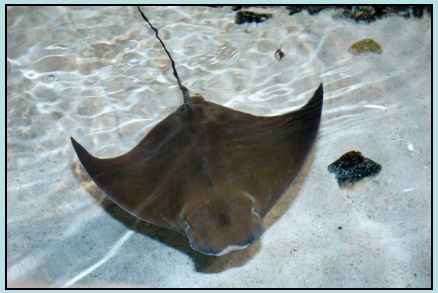
Bare mud - few species

Complex reefs - many species

Some species associated with oyster reefs








Spottailed bass
Black Drum
Croaker
Southern flounder
Summer flounder
Kingfish
Spotfin mojarra
Silver perch
Pigfish
Pinfish
Spotted Seatrout
Sheepshead
Gray snapper
Spadefish
Spot
Weakfish

Anchovies
Striped blenny
Speckled worm eel
Gobies
Thread herring
Menhaden
Mullet
Mummichog
Chain pipefish
Silversides
Oyster toadfish
Ladyfish
Bluefish
Lookdown
Permit
Leatherjacket

Crevalle jack
Gizzard shad
Cownose Ray
Smooth Butterfly Ray
Atlantic Stingray
Bonnethead Shark
Sharp-nosed shark
Grass shrimp
Brown shrimp
White shrimp
Blue crab

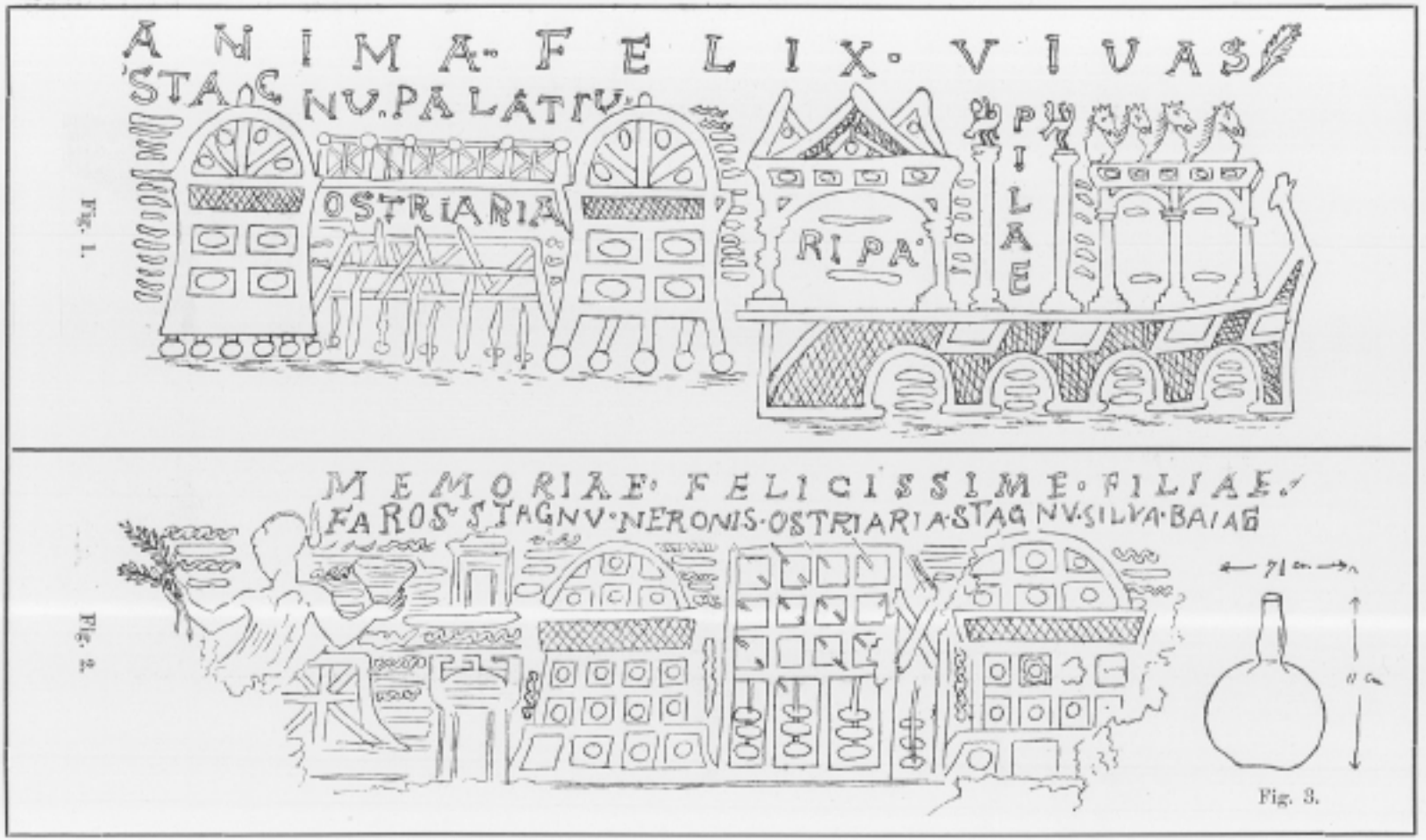
Snapping shrimp
Mussels
Clams
Mud crabs
Polychaete worms
Oyster drills
Tulip shell
Whelk

Oysters are natural breakwaters

- Reduce wave energy
- Protect saltmarsh
- Reduce bank erosion
- Trap silt so marsh can expand

Photo courtesy of SCCCL

Oyster Culture in Italy dates to at least the 1st Century AD



"Ostriarium"

Brief history of oyster industry

- Introduced to pilgrims by the Wampanoag Indians at the first Thanksgiving
- Industry boomed in late 1800s when shipping became possible – 15 million bushels per year
- Many oysters were moved from Chesapeake to bays further north which had been depleted
- Late 1800s: oysters saloons, oyster parlors, oyster cellars and oyster bars were fashionable hang-outs

Brief history of oyster industry

Industry began to decline in 1900s:

- reduced demand
- concern for sanitation
- competition with other food industries
- reduced harvests:
  - overharvesting
  - habitat destruction
  - inadequate shell replanting
- decline in water quality
- diseases

Current Chesapeake Bay harvest is less than 1% of historic highs

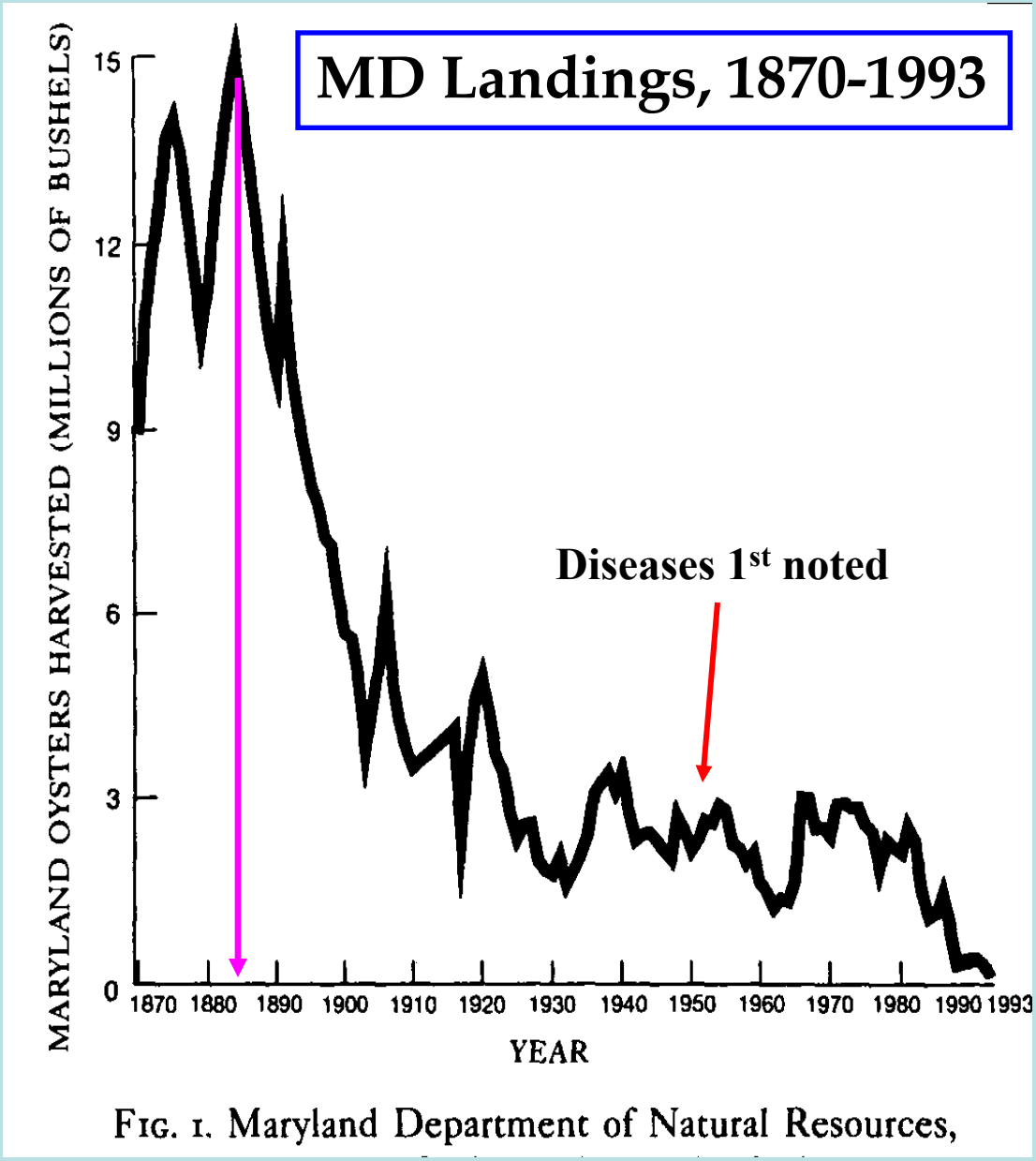
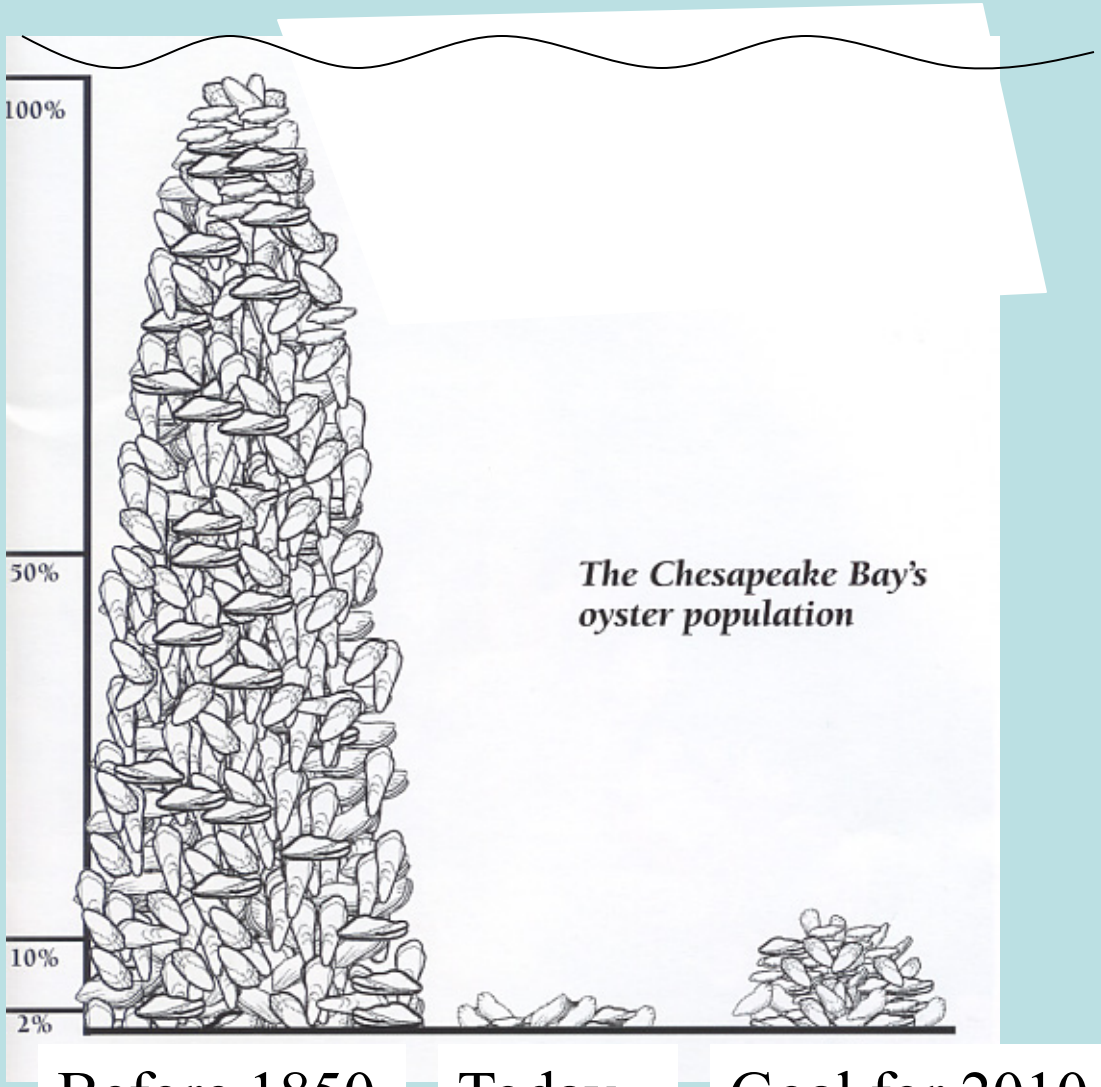


FIG. 1. Maryland Department of Natural Resources,


100%
50%
10%
2%
The Chesapeake Bay's
oyster population
Before 1850
Today
Goal for 2010

Where did all the reefs and shell go?

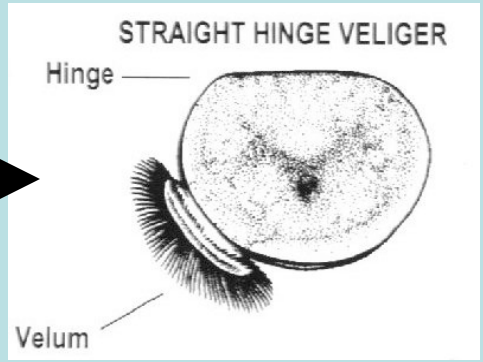
One year's shell from a single Chesapeake Bay shucking house

15 million bushels?

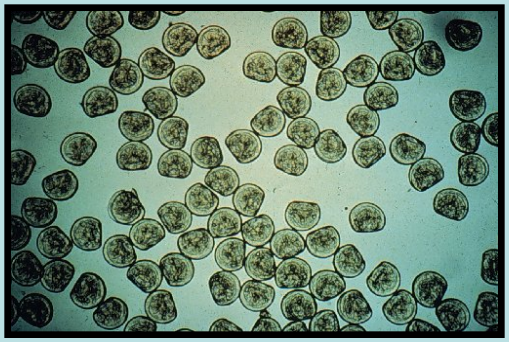
Oyster Shell Is used for Road Beds and Other Decorative Uses

Life cycle

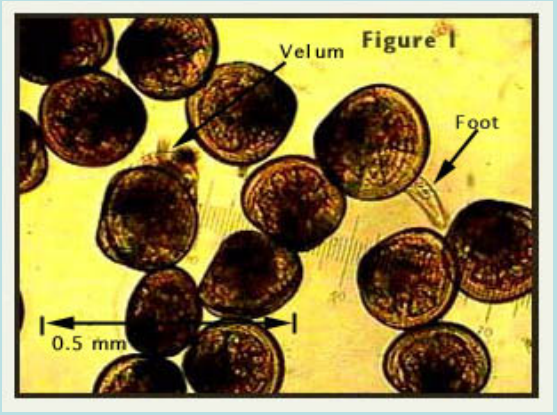
During summer months, adult oysters spawn millions of eggs and sperm into the water column.



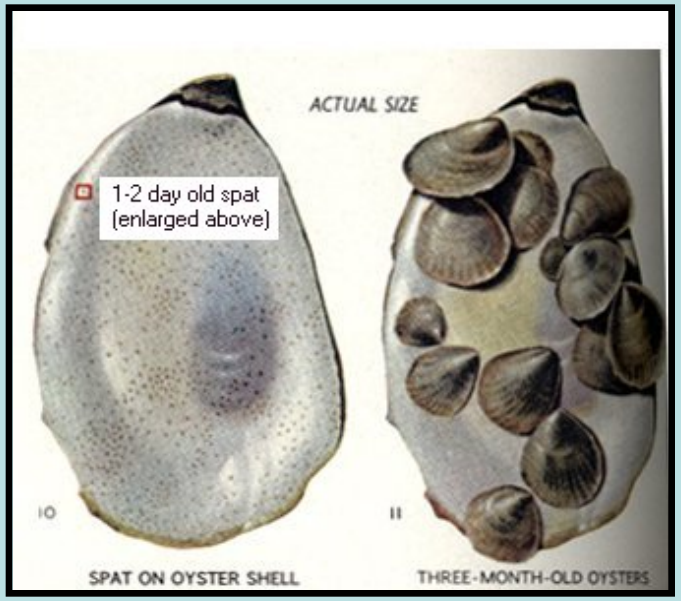
Within 24 hours a free-swimming, microscopic larva is formed.



After 2-3 weeks the larva develops a foot and settles to the bottom.



The larva cements itself to a hard surface, preferably another oyster shell. The settled oyster ("spat") can never move again.



Replanting oyster shell restores the habitat for future oyster generations.

What will happen if the oysters disappear?

- Erosion - increased silt loads, less filtering by marsh - cloudy water - reduced oxygen
- Increased nutrients - algal blooms
- Eutrophication: algal boom and bust = low oxygen
- More “red tide” events
- Food chain disruption - fewer fish, crabs, shrimp
- More health department closures
- Fewer/no oysters to harvest

What will happen if the oysters disappear?

Chesapeake Bay has lost 98% of its oysters. In summer 2007 the Chesapeake Bay Foundation reported:

- Blooms of harmful algae caused dangerously low levels of life-sustaining dissolved oxygen.
- More than 40 fish kills due to algae or oxygen-deprived dead zones.
- One algal bloom killed more than 300,000 fish.

SC Oyster Industry

Cannery-based industry

Peaked in early 20th century - ~ 1.5 million bushels

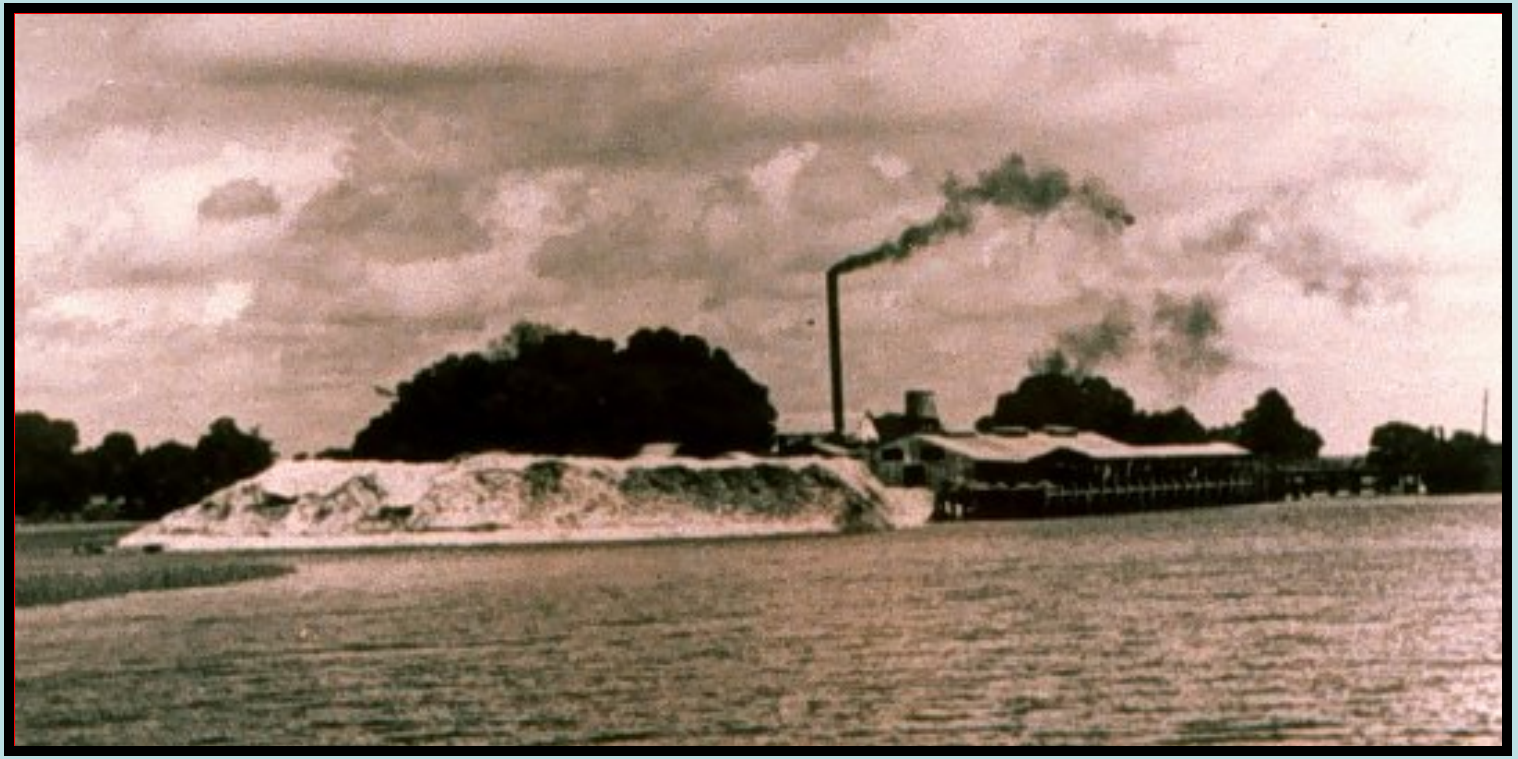
Canneries began to close in 1950s

- Competition with cheap imports
- High labor costs

Since last cannery closed, harvest has remained steady at about 100,000 bushels

Current industry caters primarily to local oyster roasts

Recent interest in aquaculture to produce single oysters for half-shell trade



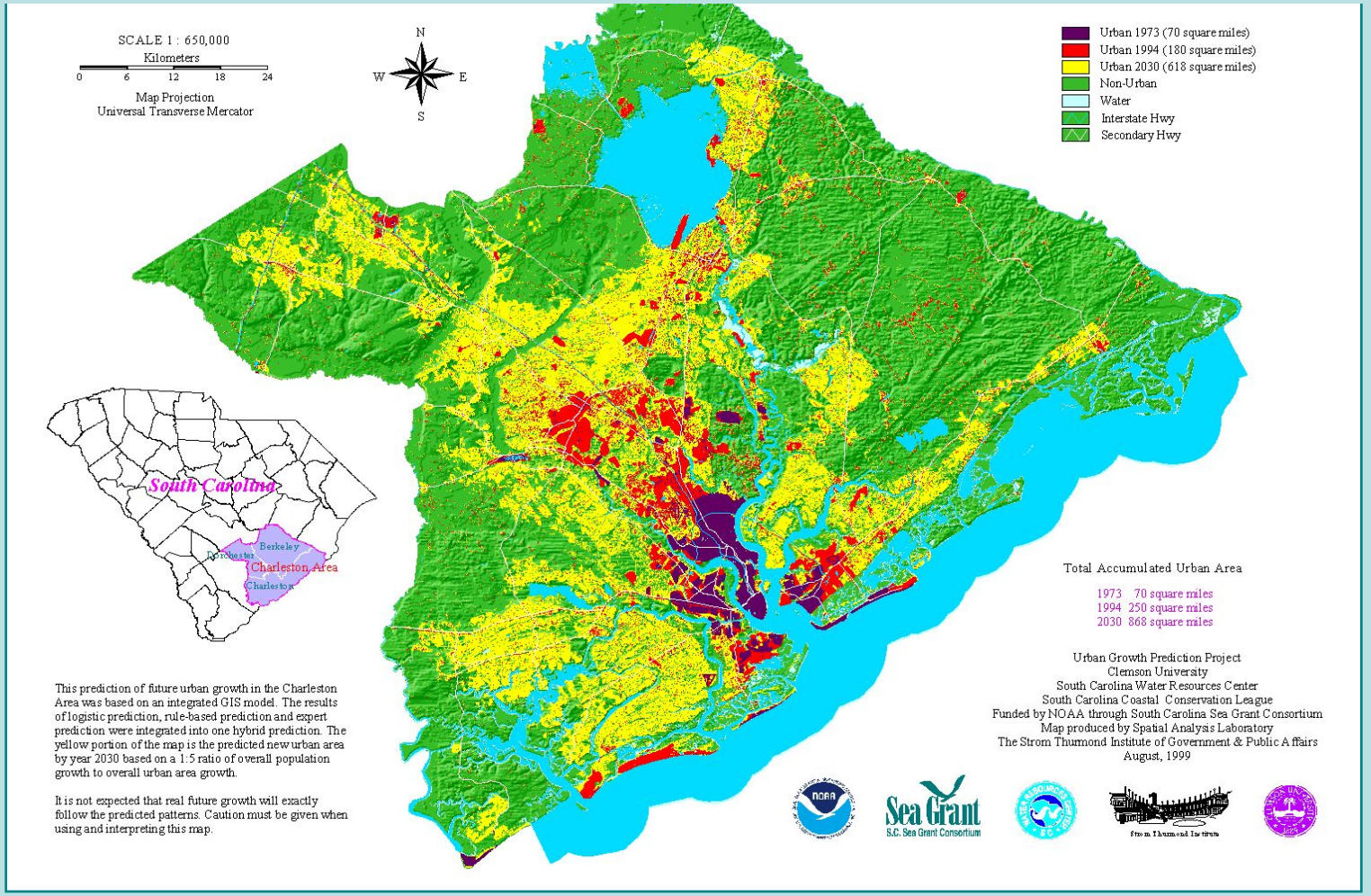
- Oyster canneries harvested thousands of bushels of oysters annually. They also managed their grounds and replanted thousands of bushels of shell annually.
- Since the last cannery closed in 1986, shell replanting has lagged behind harvesting.
- Without the concentrated shell piles, getting the shells for replanting is difficult.

Factors Affecting Oyster Resources in South Carolina

- **Coastal Development**
  - **Runoff (Sedimentation; Contaminants; Excess nutrients)**
  - **Health department closures**
  - **Boat traffic**
    - **Wake impacts**
    - **Fuel**
    - **Marinas/docks**
- **Habitat destruction**
- **Increased harvest pressure**
- **Insufficient Shell Replanting**

Once productive oyster grounds near Hilton Head

Charleston Area Urban Growth



1973	1994	2030
70 sq mi	250 sq mi	868 sq mi

Coastal Development

1994

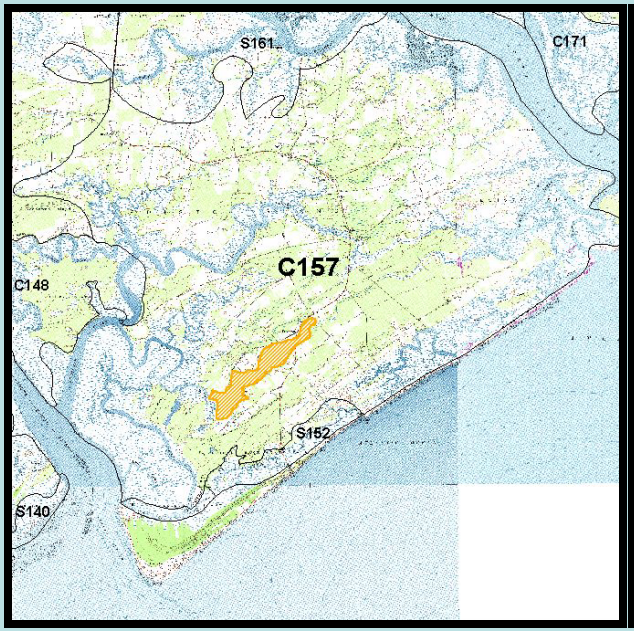
1999

Horlbeck Creek, Charleston Co.

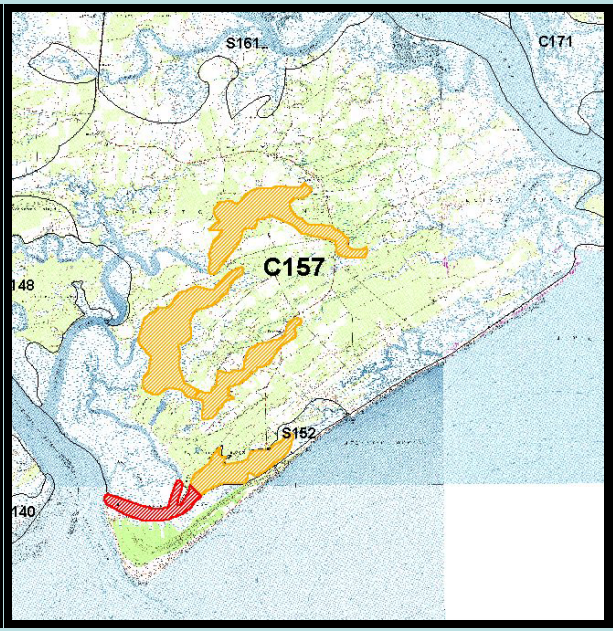
(adapted from F. Holland)

Decline of harvestable area on C157 in ACE Basin From 740 acres in 1978 to 1 acre in 2000

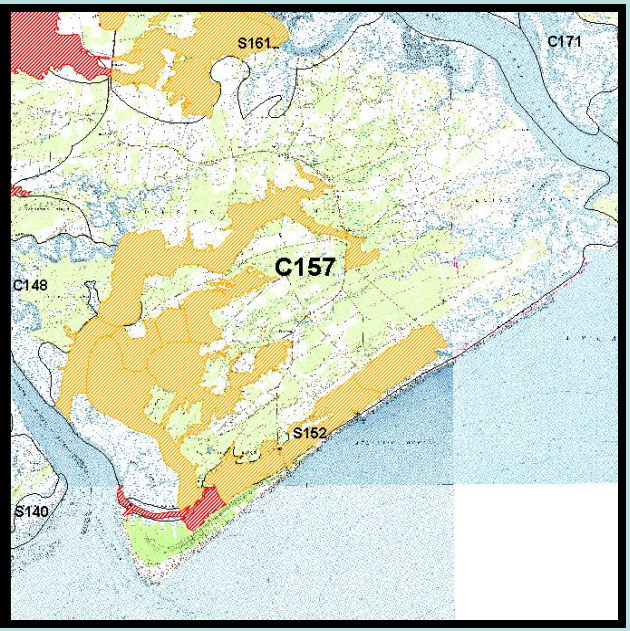
1978: 740 acres



1991



2000: 1 acre



Conditional
Restricted
Prohibited

SC Intertidal Oyster Resources

~ 3000 acres of oyster habitat

~30% closed by SCDHEC

- Of the 2000 acres which are open:
  - ~ 85% is privately managed
  - ~ 10% State Shellfish Grounds
  - ~ 5% Public Shellfish Grounds (recreational only)

  Total of 150 acres reserved for recreational only

SC Oyster Ground Classifications

State Shellfish Ground - 72

- Designated and managed by SCDNR
- Commercial and recreational harvesting
- 11 SSG are designated recreational only

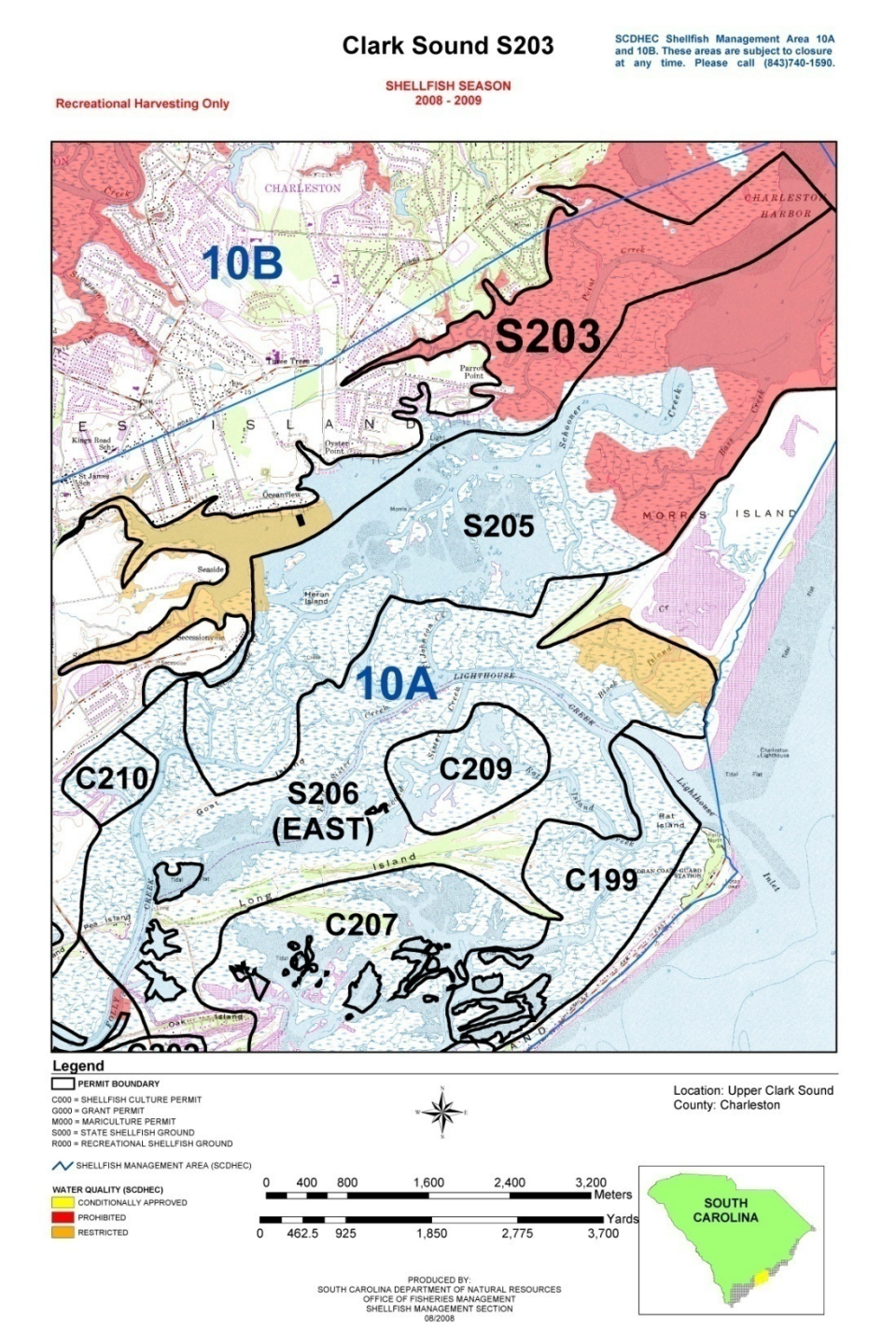
Public Shellfish Ground - 20

- Designated and managed by SCDNR
- Recreational harvest only

Culture Permit - currently 115

- Private party pays to have exclusive rights
- Permitholder must maintain the grounds
- Harvesting with permission of culture permit holder

Typical oyster grounds map.
S203 Clark Sound.



DNR

SC Oyster Harvest Regulations

http://dnr.sc.gov/marine/shellfish/regs.html

Links to shellfish maps

Recycling information

Recreational and commercial regulations

SC Recreational Shellfish Harvest Regulations

Season

Oct 1- May 15

Saltwater recreational license

$10 SC resident, $35 non-resident, free 65 and older

State and public shellfish grounds

Limits for oysters:

- 2 bushels per day, no more than 2 days per week
- No size limit

Limits for clams:

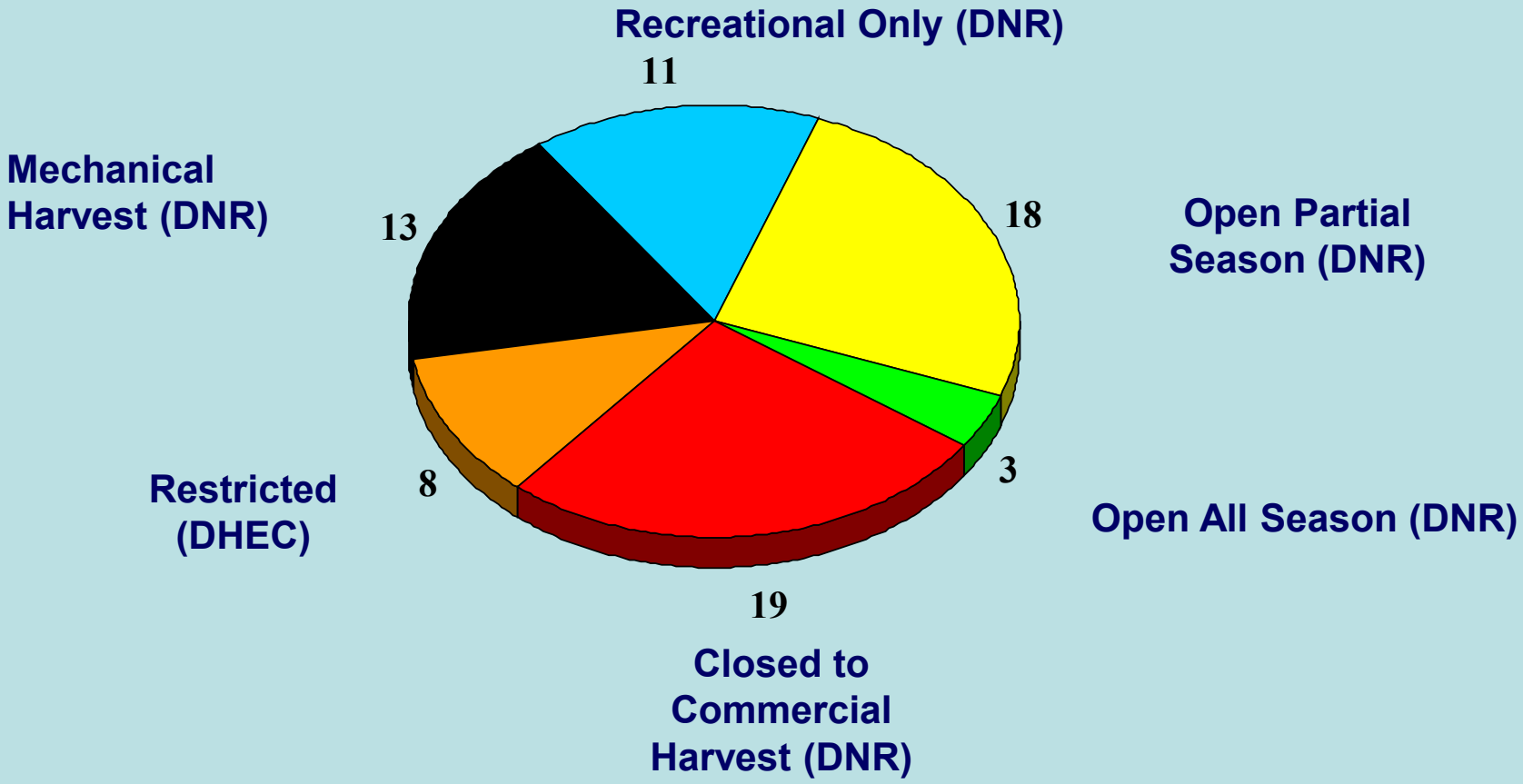
- 1/2 bushel per day, no more than 2 days per week
- 1 inch thick

Current DNR Oyster Management Strategy

- Annual qualitative assessment of SSGs
- Management closures allow grounds to recover naturally
- Encourage cull in place
- Permit-holder and DNR-contracted shell planting: ~60,000 bushels/yr
- Work with permit-holders to find and test alternate substrates

Classification of SSGs for Oyster Harvesting

2007/2008 Shellfish Season



Total Number of Designated SSGs = 72

Large-scale Shell Planting on PSGs and SSGs

Before

After

Shell Recycling Program

Recycle
Oyster Shell

DNR

South Carolina Saltwater Recreational Fishing License

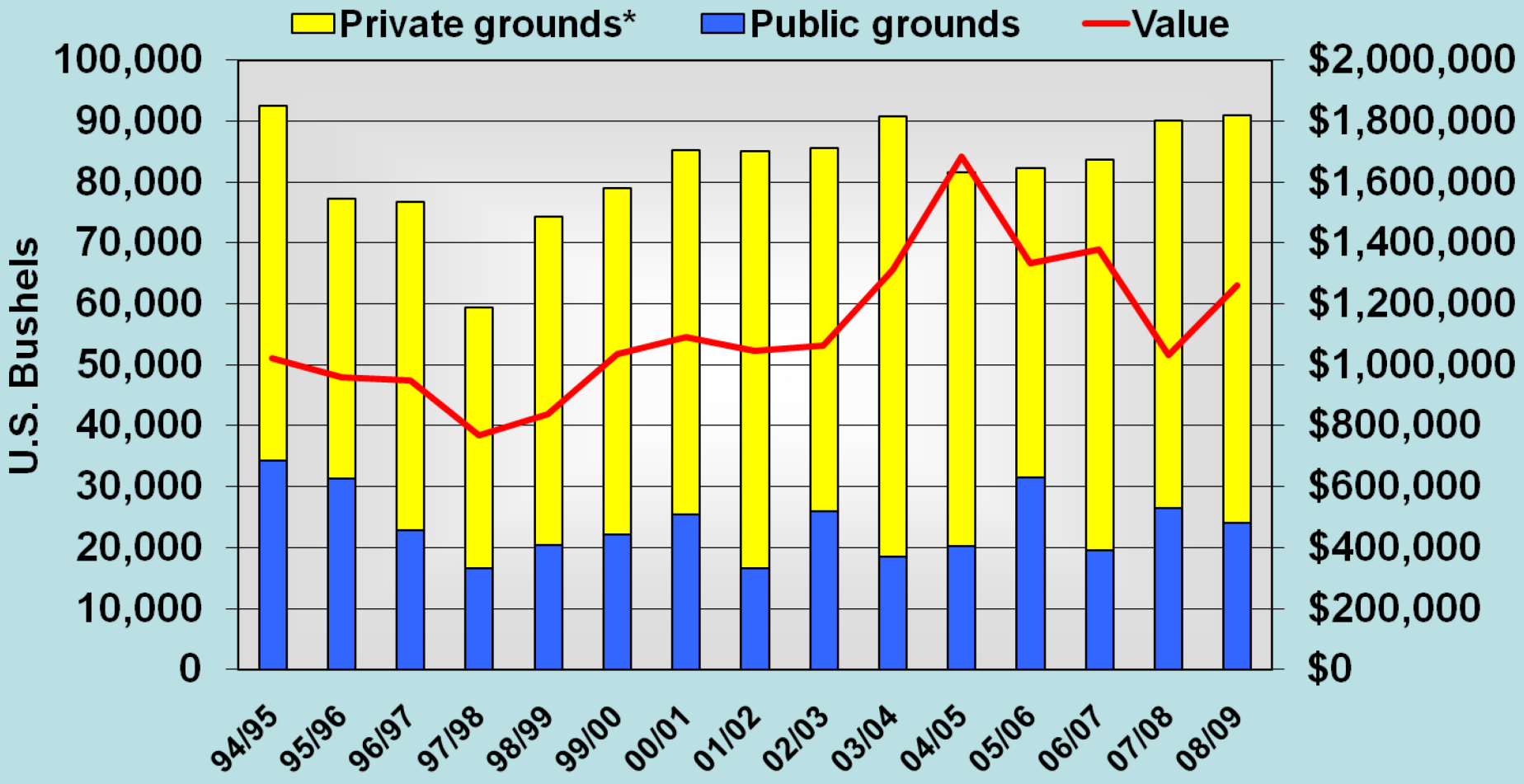
- 16 drop-off sites along the coast
- More to be added
- Also evaluating potential for recycling in mid- and up-state.

For assistance call: (843) 953-9397

For maps:
http://saltwaterfishing.sc.gov/oyster.html

S. C. Commercial Oyster Landings and Value

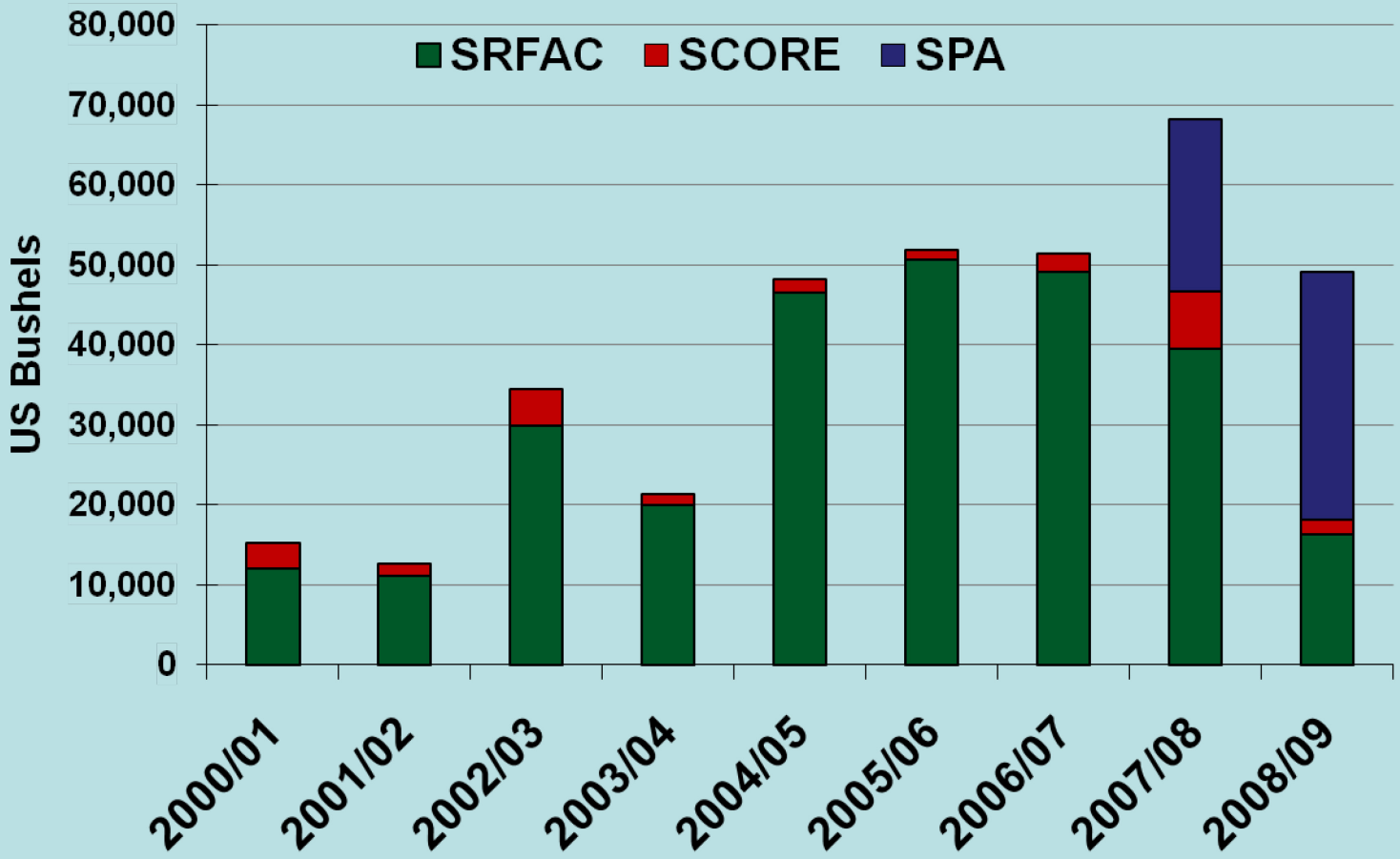
1994/1995 - 2008/2009 Seasons



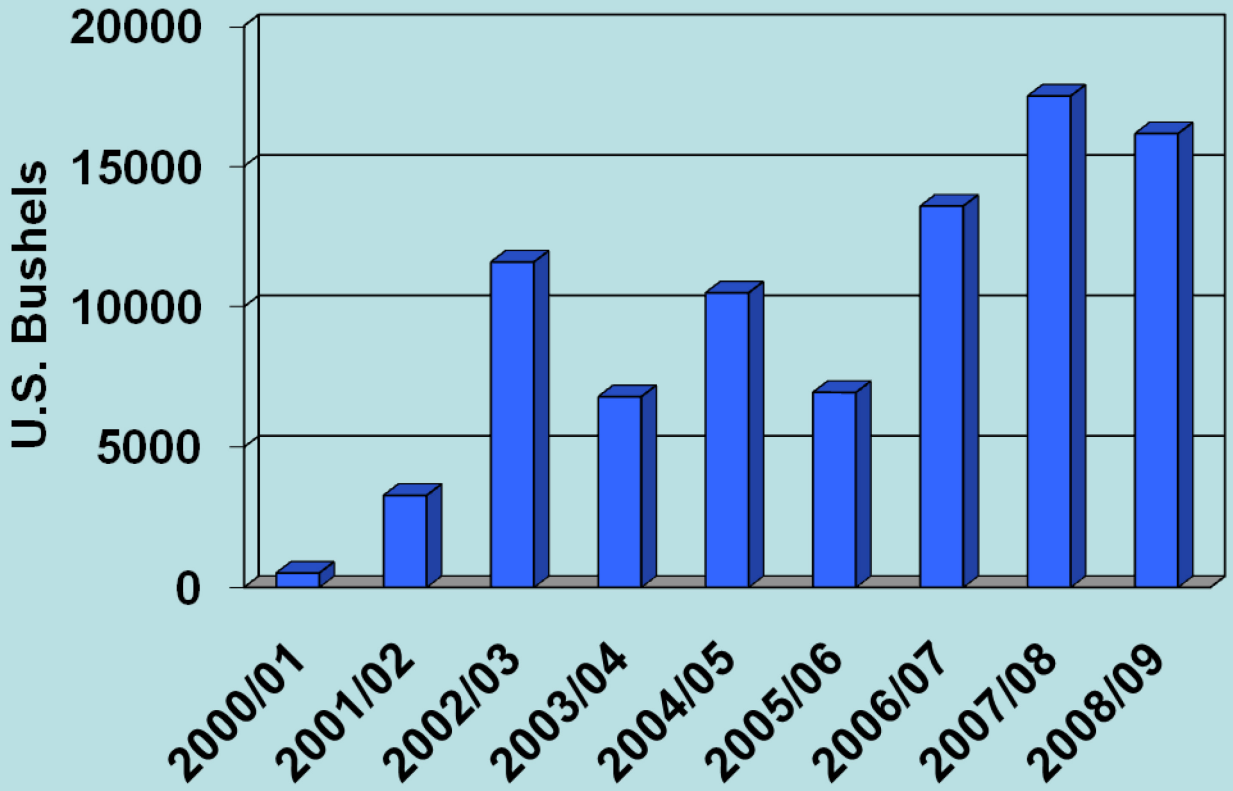
* Culture Permits and Grants

Produced by: SCDNR / MRD / OFM / Shellfish Management Section

Shell Planting on Public Grounds



Oyster Shell Recycled



HARVEST: ~100,000 bushels (commercial only)

recreational harvest may be ~50% of commercial

IMPORT:~120,000 bushels

RECYCLE: 15,000 bushels +12,000 by leaseholders

! **Less than 13% of the oysters harvested and imported are being recaptured through shell recycling or recapture by leaseholders.**

HARVEST: ~100,000 bushels (commercial only)

PLANT: 50,000 (DNR)+ 12,000 (leases)=62,000 bushels

PURCHASE: 35,000 bushels

- Shell planting lags harvest by ~40-50,000 bushels per year. This is not sustainable!
- DNR spends as much as $70,000 to purchase shell from out of state. This is not sustainable!
- Less than 13% of the oysters harvested are being recaptured through shell recycling or recapture by leaseholders. If we could capture an additional 15% of that shell it would save DNR $70,000 which could be used to increase the area planted annually.

Initiatives

- Recapture shell from restaurants
  - A recent survey revealed that half of all oysters sold end up at restaurants
  - Fisher Recycling/Nature Conservancy partnership picking up from Charleston restaurants
- Recapture shell from inland outlets
  - CCA partnership
  - Volunteer initiatives
- Legislation to create tax credit for shell donations

SCORE Community-Based Oyster Restoration Program

Volunteers

- Recycle shell
- Build oyster habitat
- Monitor water quality
- Work with scientists
- Gain a vested interest in natural resources

Value of Volunteer Program

- Augments DNR workforce – more with less
- Build more reefs, collect more data
- Participants gain a vested interest in natural resources
- More than 8,000 volunteers have participated since 2001, donating over 25,000 hours to the project
- Volunteer time can be used as match to leverage grant dollars
- Program is entirely grant-funded

Environmental Action Volunteers (EAV)

Volunteer – run Shell Recycling and Bagging Program, Bluffton, SC

Recycled and bagged ~ 1,000 bushels of shells each year since 2002

Shell Bagging

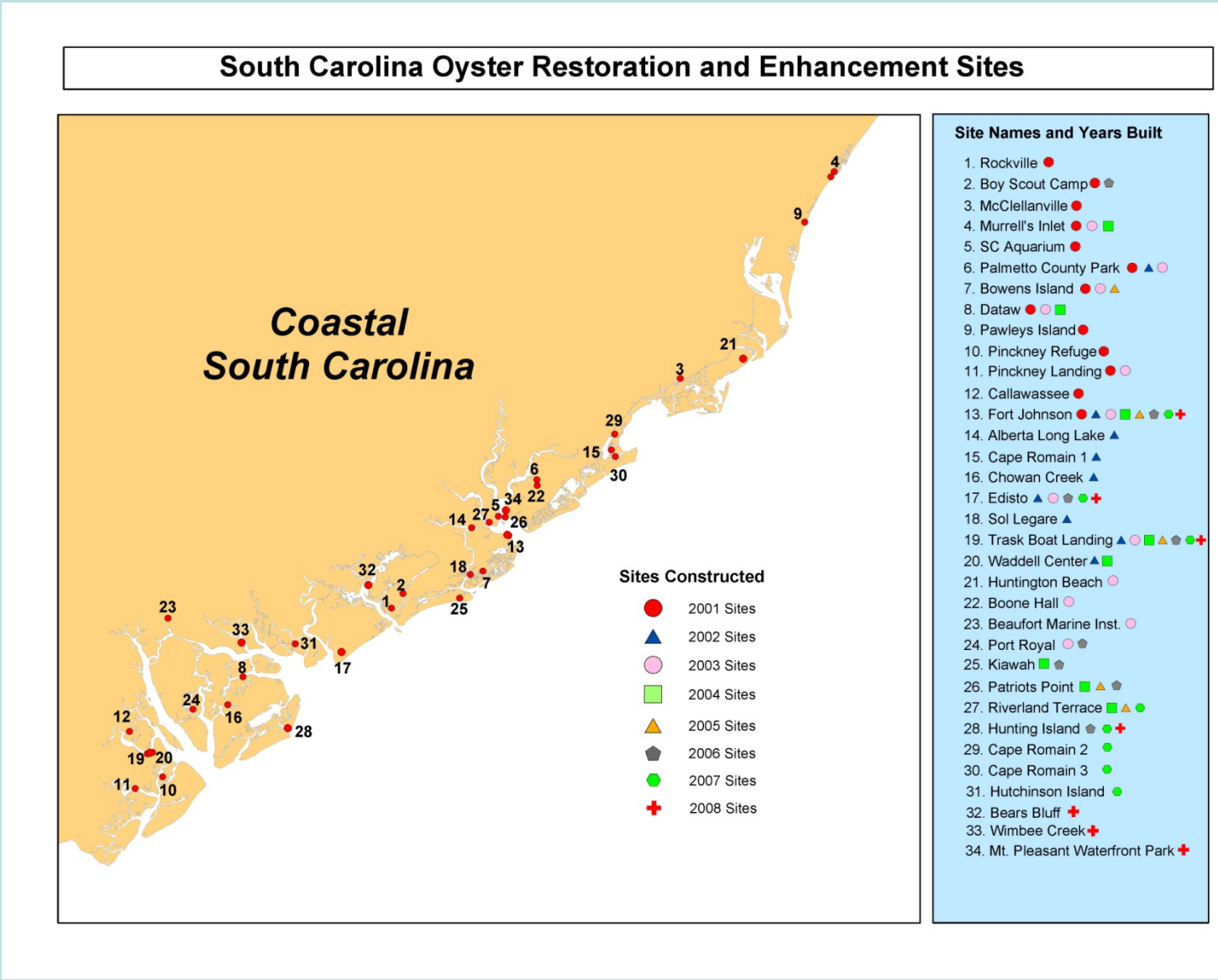
More than 30,000 bags since 2001

Filled with ~500 tons of oyster shells

Reef Building

188 reefs at 35 sites since 2001

Between 2001 and 2008 SCORE volunteers constructed 161 reefs at 34 sites along the coast, using more than 450 tons of shell.



Oysters quickly colonize the shell bags and a complex three-dimensional habitat can result in only a few months.

After <u>one year</u> a typical SCORE reef is home to:

24,000 Oysters

7,500 mussels

4,300 crabs

Impacts of SCORE reefs

- Potential to filter 220 million gallons of water each day
- Reduced erosion, marsh regrowth
- Increased habitat - ~ 9 million oysters and their associated nooks and crannies
- ~ 3 million mussels
- ~ 2 million mud crabs
- Food for ???? Fish and other larger animals

Habitat benefits begin immediately!

Shoreline stabilization leads to marsh regrowth

Marsh re-growth begins after 2-3 years

SCORE reefs are research platforms

DNR scientists

- study reef development
- interactions with shoreline
- interactions with water quality
- habitat value

DNR scientists test new methods on small scale

- cost effective way to develop new ways of managing oyster reefs

SCORE reefs are living classrooms

Water quality
Biodiversity
Habitat
Ecosystem dynamics
Food webs
Shellfish biology

Volunteer Water Monitoring

Volunteers monitor water quality weekly at 20 or more sites along the coast.

- Parameters:
  - Weather
  - Salinity
  - Dissolved oxygen
  - Temperature
  - Water clarity

Water Quality Monitoring

- How does restoration affect water quality?
  - Differences among sites
  - Determine factors which make a “good” site
- Document restoration effects on water quality
- DNR trains volunteers and provides equipment
- Volunteers monitor once a week and enter the data online

Stewardship opportunities

Shell Bagging:

Schedule an event for your group

Join a scheduled group

- Nov 3 2:30-5:00
- Nov 7 3:00-4:45
- Nov 13 3:00-5:00
- Nov 14 10:00-12:00

Please let us know if you are coming so we can notify you of changes in plans.

Water Quality monitoring

- contact Holly Nettles 843 953-9057

Stewardship opportunities

Shell Recycling

Maps of drop off sites are available at:

http://saltwaterfishing.sc.gov

To alert us to a large event, or to get assistance with a pickup call:

Ben Dyar (843) 953-9397

Andy Jennings (843) 953-9396

Stewardship opportunities

- **Reef building –** begins in March or April. Watch the SCORE website for the schedule or sign up to be on our email alert list. We need 20-40 people for each reef-building event which will last 2-3 hours.

  Charleston area reef building will include Daniel Island, Riverland Terrace, Fort Johnson and Bears Bluff. We will also build reefs in the ACE Basin and Beaufort area and at Murrells Inlet.

Contact Info

http://SCORE.dnr.sc.gov

Holly Nettles (843) 953-9057

nettlesh@dnr.sc.gov

Volunteer coordinator; water monitoring program

Nancy Hadley SCORE project manager

Recreational Aquaculture program

(843) 953-9841 Hadleyn@dnr.sc.gov

Michael Hodges (843) 953-9241

Reef construction

Hodgesm@dnr.sc.gov

DNR

Contact Info
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Stewardship opportunities

Coming in 2010: **Spat Bag Hosting**

Have a dock? Collecting spat in the summer allows DNR to build reefs year-round.

For more information
contact Nancy Hadley
(843) 953-9841
hadleyn@dnr.sc.gov

Stewardship opportunities

Coming Soon: **Recreational Aquaculture**

- Gain a personal stake in your water quality
- Educate your neighbors
- Improve filtration by growing oysters under your dock

Added bonus: you get to eat them!

- For more information contact Nancy Hadley

DNR Oyster Goals

DNR

- Maintain and increase oyster reefs
- Improved water quality
- Increased habitat for fish, crustaceans, birds
- Reduced erosion
- Healthy ecosystem
- Involved citizens = long-term success